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Contributions to the knowledge of North American Sphagna. III.

C. WARNSTORF.

B. *Branch leaves with pores and fibrils.*

1. Branch leaves ovate-lanceolate, lanceolate to almost long-linear.

a. Stem leaves in the upper part with resorbed membranes, and therefore the apex lacerate-fimbriate.

a. Stem leaves widened upward, spatulate, and fringed at the broad rounded apex, like S. fimbriatum.

13. *S. Lindbergii* SCHPR. Entw.-Gesch. d. Torfm. p. 67, no. 6 (1858).

Syn: *S. cuspidatum β. fulvum* Sendt. MSS. 1838.

New York, Canada, Newfoundland, Greenland, Miquelon Island (*Delamare*).

β. Stem leaves triangular-linguiform, lacerate two-cleft at the apex.

14. *S. riparium* AONGSTR. in Oefvers. V. Ak. Handl. 21, p. 198 (1864).

Syn.: *S. cuspidatum γ. speciosum* Russ. Beitr. p. 57 (1865).
S. speciosum v. Klinggr. (1872).
S. spectabile Schpr. Synops. 2d ed. p. 834 (1876).

Greenland, New Herrenhut (*Spindler*); Kotzebue Sound, N. W. America (*Seemann*. Herb. *Mitten*); New Jersey; New Hampshire, Crawford House, 1,900 ft. (*Faxon*).

This beautiful, most characteristic species must surely be common in North America, but has hitherto been mostly overlooked or not distinguished. Lindberg regards it, in Hvit-mossor, as merely a sub-species of S. cuspidatum; Cardot only mentions it, in Rév. des Sphaignes, in connection with S. cuspidatum var. Miquelonense Ren. et Card. Miss Cummings does not include it in her Catal. of Musc. and Hep. of N. America, and passes over it in silence.

S. riparium is, with the exception of S. cuspidatum, var. Torreyanum, the stateliest of all the CUSPIDATA, and sometimes attains to the size of the strong forms of S. squarrosum. It is always easily and certainly distinguished from all the other species of this group by the stem leaves which are tri-

angular-linguiform, always lacerate two-cleft at the apex and without fibrils, as well as by the large membrane-gaps on the outer side of the leaves of both kinds of branches or only of the pendent ones, in the upper angles of the cells.

b. Stem leaves either with isolated membrane-gaps on both surfaces at the extreme tip only, or entirely without them. Fibrils sometimes present, sometimes absent.

a. Stem leaves mostly small, equilateral-triangular to short isosceles-triangular and pointed, or triangular-linguiform and obtuse, mostly nonfibrillose, rarely fibrillose in the apical part. Branch leaves narrowly bordered; on the inner side with numerous round pores in nearly all the cell angles, on the outer side near the apex almost free from pores, or with single or numerous small, imperfectly ranged pores on the commissures, but in the middle and lower part of the leaf near the margins with rather large pores in the upper cell-angles.

15. *S. recurvum* (P. B.) Russ. et Warnst. in Sitzungsber. der Dorpater Naturf.-Ges. 1889, p. 99.

Syn.: *S. intermedium* Hoffm. Deutschl. Fl. 2, p. 22 (1796), according to Lindb., Braithw. and others.

S. cuspidatum Ehrh. C. Müll. Synopsis I. p. 96 (1849).

S. pulchricoma C. Müll. Synops. I. p. 102 (1849).

? S. flexuosum Dz. et Mlkb. in Prodr. Fl. Batav. 2, P. 1, p. 76 (1851).

S. variabile Warnst. var. Europ. Torfm. p. 60 (1881).

S. Serræ C. Müll. 1889 in litt.

Var. *pulchrum* Lindb. in Braithw. Sphagn. of Eur. and N. Am. (1880).

A stately, beautiful form. Stem leaves triangular, pointed, with or without fibrils in the apical part. Branch leaves mostly closely imbricate, when dry slightly undulate, when moist distinctly five-ranked, broad-lanceolate, rather abruptly contracted into a short narrowly truncate dentate point. Color of the tufts varied, the heads often fine yellowish brown or dirty brown, and the other parts green or blanched.

Miquelon Island (*Delamare*); New Jersey (*Austin*); New Hampshire, Crawford House, 1,900 ft. (*Faxon*).

Var. *mucronatum* Russ. as subsp. in Sitzungsber. der Dorpater Naturf.-Ges. 1889, p. 99.

Stem leaves mostly small, triangular, acuminate and without fibrils, or in the hemiisophyllous forms larger, isosceles-triangular and with fibrils in the apical part. Branch leaves lanceolate, longer-pointed, when dry beautifully undulate and with recurved points, when moist not obviously five-ranked. Color green, whitish or in the heads pale yellowish.

Mass. Boston, Brookline and Bedford, 50 to 100 feet (*Faxon*).

Var. *amblyphyllum* Russ. as subsp. in Sitzungsb. der Dorpater Naturf.-Ges. 1889, p. 99

Similar to the preceding var. and differing from that only by the stem leaves which are triangular-linguiform and furnished at the rounded apex with isolated membrane-gaps, and nearly always without fibrils. Here belongs *S. pulchricoma* C. Müll.

N. H., Crawford's, 1,900 ft., Franconia, 1,000 ft.; Mass., Boston, Dedham and Brookline, 50 to 100 ft. (*Faxon*).

Var. *parvifolium* (Sendt.) Warnst. in Flora 1883, p. 374.

Syn.: var. *tenue*, v. Klinggr. (1872).
var. *angustifolium* C. Jens. 1884 in litt.
var. *gracile* Gravet, Warnst. Europ. Torfm. p. 67 (1881).
subsp. *angustifolium* (Jens.) Russ. in Sitzungsb. d. Dorpater Naturf.-Ges. 1889, p. 99.

Tall and slender, or in lower compact tufts. Stem cortex usually not clearly distinct from the wood cylinder. Stem leaves small, triangular-linguiform, not fibrillose or toward the apex fibrillose. Branch leaves small, slightly undulate or even without a trace of undulation; in the latter case mostly densely imbricate, the plant then being in habit quite similar to S. acutifolium. On the outer side of the apical half with small imperfectly ringed pores on the commissures, which in the preceding varieties are almost entirely wanting. Leaves of the pendent branches with large membrane-gaps in the upper angles of the cells.

New Hampshire, Crawford House, 1,900 ft., Franconia Notch, 2,000 ft. (*Faxon*).

The species nearest related to S. recurvum is the beforementioned *S. obtusum* Warnst. in Sitzungsber. der Dorpater Naturf.-Ges. 1889, p. 99. The latter is distinguished from S. recurvum chiefly by the stem leaves larger, linguiform, not fibrillose, and somewhat fimbriate at the rounded apex, also by the occurrence, on the outer side of the branch leaves, in greater or less number, in one or two rows, of very small pores with ill-defined outlines which, as already mentioned, can only be made visible by intense staining. In this connection I would suggest that it is only by staining the leaves that one can form a safe judgment concerning the relationships of the Sphagna with respect to their pores which usually are quite different on the two surfaces of the leaf. S. obtusum sometimes attains to the size and strength of S. ri-

parium; I have not yet seen specimens from N. America, but I do not for a moment doubt that it will be found there in swamps on the shores of lakes and ponds.

β. Stem leaves larger, isosceles-triangular, usually with fibrils in the apical part. Branch leaves broadly bordered and mostly involute far down on the margins; on the inner side with few or many pores in the cell-angles, on the outer side with only small pores in the upper angles of the cells.

16. *S. cuspidatum* (Ehrh.) Russ. et Warnst. in Sitzungsber. der Dorpater Naturf.-Ges. 1889, p. 99.

Syn.: *S. cuspidatum* β. *plumosum* Bryol. Germ. I. p. 24 (1823).

S. cuspidatiforme Breutel in Flora 1824, p. 437.

S. hypnoides (A. Braun) Bruch in Flora 1825, p. 629.

S. laxifolium C. Müll. Synops. I, p. 97 (1849).

S. Torreyanum Sull. in Mem. Am. Acad. n. s. iv., p. 174 (1849).

S. cuspidatum β. *submersum* et γ. *plumulosum* Schpr. Entw.-Gesch. der Torfm., p. 61 (1858).

S. variabile Warnst. var. 2, in part, Europ. Torfm. p. 69 (1881).

S. Naumanii C. Müll.

S. Bernieri Besch. (1879).

S. Gabonense Besch. (1883).

S. falcatulum Besch. (1885).

Var. *Torreyanum* (Sull.).

Syn.: *S. cuspidatum* var. *Miquelonense* Ren. et Card. in part, Rév. des Sphaignes de l' Amérique du Nord (1887).

Of all the forms of S. cuspidatum the most stately and robust. Stem leaves large, isosceles-triangular, acuminate or obtusish, broadly and almost uniformly bordered to the base, free from fibrils or with rudiments of fibrils in the upper part. Branch leaves very large, long-lanceolate, 4 to 5 times longer than broad, tubular-concave, broadly bordered, dentate only at the truncate point; when dry usually secund falcate and slightly undulate; entirely free from pores on both sides of the leaf.

Essex Co., N.Y. (*Torrey*). Miquelon Island (*Delamare*). Mass., Milton, 500 ft., Brookline, 100 ft. (*Faxon*).

Var. *Miquelonense* Ren. et Card. in part, l. c.

Plants strong but weaker than in var. Torreyanum. Stem leaves rather large, triangular-linguiform, dentate at the usually obtuse apex, edges with a broad border much widened downward, mostly without fibrils, rarely with rudiments of fibrils near the apex; on the outer side with large, roundish or longish-oval membrane-gaps. Branch leaves large, wider

or narrower, long-lanceolate, when dry faintly undulate and more or less falcate, above tubular-concave, at the edges broadly bordered by 5 to 8 rows of narrow cells; on the inner side with numerous pores in nearly all the cell angles, becoming gradually smaller toward the base; on the outer side the pores are more scanty, especially in the lateral angles of the cell, sometimes one very strong-ringed pore in the upper angle of the cell, the larger pores often with imperfect rings, becoming gradually larger toward the base of the leaf.

Miquelon Island (*Delamare*); Mass., Milton, 500 ft. (*Faxon*), Essex Co., 100 ft. (*Robinson*).

Chiefly distinguished from var. Torreyanum by the pore-structure of the branch leaves.

Var. *falcatum* Russ. Beitr. p. 59, 1865.

N. Jersey (*Austin*); Miquelon Island (*Delamare*); Mass., Bedford, 100 ft. (*Faxon*).

Var. *submersum* Schpr. Monogr. et Synops., ed. I.

Louisiana (*Langlois*); Mass., Boston, Brookline and Bedford, 50 to 100 ft. (*Faxon*).

Var. *plumosum* Bryol. Germ. I., p. 24 (1823).

N. Jersey (*Austin*); Mississippi (*Langlois*); Mass., Boston, 75 ft. (*Faxon*).

Undeveloped plants of this variety often exhibit broadly truncate branch leaves, coarsely dentate at the apex and denticulate on the margins; these constitute the var. *serrulatum* Schlieph. Beitr. p. 15 (1865). Whether these plants are identical with *S. serratum* Austin, I can not determine, for hitherto I have been unable to obtain an original specimen of this form: that which I have received under this name from the Kew Herb. proves to be S. Floridanum. C. Müller recently cites Austin's moss as a synonym of his S. Trinitense, which I retain provisionally as a separate species, distinct from S. cuspidatum on account of the invariably divided hyaline cells of the stem leaves.

γ. Branch leaves on the inner surface almost always without pores; on the outer side with numerous larger or smaller apertures in one or two rows in the middle of the cell-wall or near the commissures, which always have sharply defined outlines and frequently in the apical half of the leaf become large membrane gaps. Stem leaves large, triangular-linguiform, almost always fibrillose near the apex.

17. *S. Mendocinum* Sull. et Lesq. in Sulliv. Icon. Musc. Suppl. p. 12 (1874).

Syn.: *S. laricinum* Aongstr. in Oefvers. V. Ak. Förh. 21, p. 197 (1864).

S. cuspidatum var. *Dusenii* C. Jens. (1886 in litt.)

S. cuspidatum var. *Nawaschini* Schlieph. (1888 in litt.)

S. cuspidatum var. *porosum* Schlieph. et Warnst.

S. obtusum Warnst. var. *Dusenii* (C. Jens.) Warnst. in Samml. Europ. Torfm. No. 97 (1888).

S. Dusenii (Jens.) Russ. et Warnst. in Sitzungsb. der Dorpater Naturf.-Ges. 1889, p. 99.

California (*Brewer*): N. Hampshire, Ethans Pond, Mt. Willey, 2,500 ft. (*Faxon*).

The occurrence of numerous pores on the outer side of the branch leaves has led Aongstrœm to refer this characteristic species to *S. laricinum* (Spruce) and therefore to place it in the Subsecunda. Lesquereux and James also erroneously place it in the Subsecunda (Manual p. 20). I myself also, in 1881, in Die Europ. Torfm. p. 90, committed the mistake of designating specimens of Aongstrœm's *S. laricinum* as var. *δ. Lapponicum*. This type, however, belongs unquestionably to the Cuspidata, and moreover in habit has the greatest resemblance to *S. cuspidatum* (Ehrh.) Russ. et Warnst.

By the presence on the outside of the leaf of larger or smaller pores with sharply defined outlines, as well as by the triangular-linguiform stem leaves, nearly always fibrillose at the apex, this species is easily and certainly distinguishable both from the forms of S. cuspidatum and from S. obtusum.

> *δ.* Branch leaves comparatively large linear-oval, distinctly dentate at the broad truncate apex as well as on the upper margins nearly to the middle, border very narrow, edge not involute; on the inner side with single small pores in the cell-angles. Stem leaves large to very large, narrow, elongate-oval, concave, with an almost cucullate, truncate, dentate apex, narrowly and uniformly bordered to the base, abundantly fibrillose throughout, the lateral margins involute far downward.

18. *S. Fitzgeraldi* Renauld in Lesq. & James Manual, p. 23, 1884.—Ren. et Card. in Rev. Bryol. 1885, p. 46.

Florida, on decaying stems and leaves of palms (*Fitzgerald*).

This extremely soft and slender plant which was collected in fruit by Fitzgerald has a very small hemispherical capsule with triangular-thickened cell-angles. The tetrahedral spores are large and measure in diameter 0.038 mm. They are pale and appear broad-edged and with the surface fur-

nished with a branching network of bands, as in certain species of Fossombronia and Riccia.

ε. Branch leaves very long and narrow, almost linear, flat, broadly bordered by 4 to 6 rows of narrow cells, margin dentate to the base, apex broad-truncate and dentate. Pores on the outer side situated solely in the upper angles of the cells, or sometimes in the upper and lower, and very small. Stem leaves large, narrow isosceles-triangular, dentate at the truncate apex, with a broad border almost equally broad to the base; every hyaline cell divided by an oblique cross-wall, fibrillose to the base of the leaf: arrangement of pores the same as in the branch leaves.

19. *S. Trinitense* C. Muell. Synops. I. p. 102 (1849).

Syn.: *S. serratum* Austin in Bull. Torr. Bot. Club, p. 145 (1877) according to C. Müller, Flora 1886.

S. cuspidatum, var. *serratum* (Aust.) Lesq. & James, Manual, p. 15 (1884).

Florida (*Fitzgerald*).

This species, an original specimen of which I have been able to examine, seems in habit very similar to a feeble S. cuspidatum var. plumosum, and also in most points agrees with that form in anatomical structure. It seems to me, however, remarkable that all the hyaline cells of the stem leaves are always divided by a cross-wall in S. Trinitense, a condition which I do not remember ever to have observed in the forms of the genuine S. cuspidatum; in the latter, indeed, cross-partitions of the hyaline cells of the stem leaves also occur, but only isolatedly. Although therefore I must admit that S. Trinitense (*S. serratum* Austin) stands extremely near to *S. cuspidatum* var. *plumosum* f. *serrulatum* Schlieph., nevertheless I am inclined to treat the former provisionally as a type distinct from S. cuspidatum, on account of the invariable cell-division in the stem leaves. A final decision can only be reached when more abundant material for investigation shall be at our disposal.

III. Sphagna squarrosa.

20. *S. squarrosum* Pers. MSS. Sw. in Schrad. Journ. Bot. 1800, I, P. 2, p. 398.

Syn.: *S. latifolium* β. *squarrosum* Wahlenb. Fl. Upsal. p. 391 (1820).

S. cymbifolium, var. *squarrosum* Bruch MSS. Bryol. Germ. I, p. 11 (1823).

S. teres, var. 1. *squarrosum* Pers. as species, Warnst. in Die Europ. Torfm. p. 121 (1881).

In North America probably as widely diffused as in Europe; I have seen specimens from Greenland, collected by Spindler at New Herrenhut, from Miquelon Island (*Delamare*), from Lower Canada (*Pringle*), and from New Hampshire, Vermont and Massachusetts (*Faxon*).

Var. **spectabile** Russ. in litt. 1888.

Branch leaves squarrose-spreading throughout.

Vermont, Westmore, 1,000 to 1,500 ft.; New Hampshire, Wh. Mts., 1,500 to 5,000 ft.; Massachusetts, N. Adams, 1,500 ft. (*Faxon*).

Var. **semisquarrosum** Russ. in litt. 1888.

Branch leaves squarrose-spreading, either only in the lower part of the stem, or only in the middle part, or only in the upper part, but in the other parts of the stem appressed to erect-spreading.

Mitis, Lower Canada (*Pringle*); N. Hampshire, Crawford's, 1,900 ft., Profile Lake, 2,000 ft., Franconia, 1,200 ft. (*Faxon*).

This species is distinguished from the next by the robust construction of all its parts, by its monoicous inflorescence and by the form of the male branches and their perigonial leaves. The papillæ which occur on the inner walls of the hyaline cells of the branch leaves, so far as they are united to the chlorophyllose cells, are as variable as they are in the Cymbifolium group; sometimes they are distinct and numerous, sometimes small, faint and almost invisible. They are the best developed in the brown forms. Still another distinct European form, var. *imbricatum* Schpr., with everywhere appressed, or in part erect-spreading branch leaves, I have not yet seen from N. America.

21. *S. teres* Aongstr. in Hartm. Skand. Fl. 8 ed., p. 417 (1861).

Syn.: *S. squarrosum*, var. *teres* Schpr. Entw. Gesch. der Torfm. (1858). *S. teres*, var. 3. *gracile* Warnst. Die Europ. Torfm. p. 125 (1881).

N. Jersey (*Austin*); Miquelon Island (*Delamare*).

Var. **imbricatum** Warnst. in litt. 1888.

Branch leaves everywhere appressed, or partially erect-spreading.

N. Hampshire, Crawford's, 1,900 ft., Lisbon, 1,000: Mass., Dedham, 75 ft. (*Faxon*).

Var. **subsquarrosum** Warnst. 1888 in litt.

Branch leaves in part appressed or erect-spreading, in part squarrose.

Massachusetts, Dedham, 75 ft. (*Faxon*).

Var. *squarrosulum* LESQ. as sp. in Moug. et Nestl. Stirp. Crypt. Vog.-Rhen. No. 1305 (1854).

Branch leaves squarrose-spreading throughout.

California (*Brewer*); New Hampshire, Mt. Washington, 5,000 ft. (*Faxon*).

That *S. squarrosulum* Lesq. can not belong to the form-series of S. squarrosum is surely proved by the dioicous inflorescence, as well as by the form of the male branches and their bracts which quite agree with S. teres.

IV. Sphagna polyclada.

22. *S. Wulfianum* GIRG. in Arch. Nat. Liv.-Est. und Kurl. 2. Ser. 2. p. 173 (1860).

Syn.: *S. cuspidatum*, var. *patens* Aongstr. MSS. Lindb. in Oefvers. V. Ak. Förh., p. 137 (1862).

S. pycnocladum Aongst. in Oefvers. V. Ak. Förh. p. 202 (1864).

Canada, New York, Greenland.

Var. **versicolor** WARNST. 1889 in litt.

Color, especially in the coma, a beautiful rose- or violet-red mixed with yellowish-green.

N. Hampshire, Franconia, 1,000 ft.; Vermont, Sutton, 1,000 ft. (*Faxon*).

Var. **viride** WARNST.

Whole plant grass-green, blanched at the base.

N. Hampshire, Franconia, 1,000 ft.; Mass., Dedham, 75 ft. (*Faxon*).

The position of this well marked species has been very differently understood by the various investigators. Sometimes it has been placed in the ACUTIFOLIUM group, sometimes in the CUSPIDATA, sometimes in the SQUARROSA; indeed, Limpricht in the Kryptogamen-fl. von Deutschland even refers it to the RIGIDUM group. It seems to me, however, that it belongs to none of the groups mentioned, but that, by its anatomical structure and especially on account of the numerous branches (6 to 13) in a fascicle, it represents a separate type among the Sphagna, to which I have in vain sought for an analogue among all the known species of the earth, although I have examined already about 200 established species. I therefore do not hesitate to consider S. Wulfianum as the only present representative of a separate group, the SPHAGNA POLYCLADA. The case is the same with Sphagnum Aongstrœmii, not yet met with in N. America, which also I account as the representative of a separate group, the SPHAGNA TRUNCATA.

It may have become known to North American bryologists that Russow and I have recently found, in S. Wulfianum, papillæ on the inner walls of the hyaline cells of the branch leaves, so far as they are united to the chlorophyllose cells. But little material of this magnificent species has hitherto been sent to Europe from N. America; for Cardot in Rév. des Sphaignes de l'Amérique du Nord. p. 16 (1887), says, "Je n'ai pas encore vu cette espèce d'Amérique." So much the greater was my surprise and joy on receiving from Mr. Edwin Faxon abundant and beautiful specimens of this moss.

V. Sphagna rigida

23. *S. compactum* DC. (Lam.) Fl. Franç., 3 ed. p. 443 (1805).

Syn.: *S. pramorsum* Z. D. Musc. Thuring. no. 18 (1821).

S. immersum Bryol. Germ. 1, p. 11 (1823).

S. ambiguum Hüben. Muscol. Germ. p. 25 (1833).

S. strictum Sulliv. Musc. Allegh. p. 49 (1846).

S. humile Schpr. MSS. Sulliv. in Mem. Amer. Acad. n. s., p. 175 (1849), according to Lindb.

S. rigidum Schpr. in Mem. sav. étrang. p. 72 (1858).

S. Garberi Lesq. et James in Proc. Am. Acad. XIV, p. 133 (1879).

California (*Bolander*); N. Jersey; Pennsylvania (*Rau*); Alabama; Florida; Miquelon Island (*Delamare*).

Var. *squarrosum* Russ. Beitr. p. 77 (1865).

In lax, deep tufts of a grayish or bluish green. Fasicles approximate or more remote. Spreading branches horizontal, more rarely curved downward, leaves loosely imbricated and squarrose. S. Garberi, of which I have examined specimens from the Kew Herb., certainly belongs here.

Pennsylvania (*Rau*) according to Cardot; Mass., Bedford, 100 ft. (*Faxon*).

Besides this I now distinguish two other varieties; var. **subsquarrosum** with generally but few recurved branch leaves, mostly erect-spreading, and var. **imbricatum** with closely imbricate branch leaves. The latter form usually produces very dense low tufts of different colors; the branches are comparatively short and much crowded.

Lindberg and Cardot cite *S. humile* Schpr. as a synonym of S. compactum, which does not seem to me correct. An original specimen, collected by Lesquereux in Carolina, which Schimper himself sent to Geheeb, is a very low (a few cm. high) undeveloped form of *S. molle* Sull., with few-

branched or even quite simple stems and squarrose leaves. A branch leaf, in cross section, shows the triangular chlorophyllose cells free on the inner side, characteristic of S. molle, whereas in S. rigidum they are elliptic, nearer to the outside, and on both sides completely included.

Neuruppin, Germany, Feb. 6, 1890.

Botanical papers at the Indianapolis meeting of the A. A. A. S.

The Indianapolis meeting was characterized by the great number of botanists and botanical papers in Section F. Of the 48 papers read before the section 28 were botanical. The series of papers upon the general subject of "The Geographical Distribution of N. Am. Plants" proved to be so successful that they were ordered printed in full in the volume of Proceedings, and will be issued also as a separate pamphlet reprint. Five of the seven papers assigned at the Toronto meeting were read, Professor C. S. Sargent being absent in Europe, and Professor John Macoun being engaged in exploration in the far northwest. Professors W. J. Beal and John M. Coulter, however, had papers upon geographical distribution, which were included in the series, making seven papers upon various divisions of the subject. It was also thought wise to prepare another botanical programme for the next meeting, to be held in Washington, D. C. The committee selected a physiological subject and made the following appointments: (1) The absorption of gases, by J. C. Arthur; (2) The aeration of aquatic plants, by W. P. Wilson; (3) The absorption of fluids, by L. H. Pammel; (4) The movements of fluids in plants, by W. J. Beal; (5) Transpiration, by Chas. E. Bessey.

John M. Coulter was elected vice-president of the section for the Washington meeting.

Following are the abstracts of the botanical papers read before the section at Indianapolis, many of which will appear in full in the botanical journals, government reports, and the volume of Proceedings of the Association:

Forest Trees of Indiana: STANLEY COULTER.—The author notes that the distribution of trees in Indiana depends upon the streams rather than upon latitude or elevation. The list contains 106 species and is characterized by the abundance of Cupuliferæ (24 spp.) and the paucity of Coni-

feræ (7 spp.). Of these the most remarkable is Taxodium distichum, which is found in considerable quantity in southwestern counties where it reaches its northern limit.

Preliminary notes on a new and destructive oat disease: B. T. GALLOWAY.—The disease ravaged the oat crop in all the states of the Mississippi valley this year. It is due to a micro-organism which has been grown in various culture media and the disease produced in oats by inoculation.

Observations on the variability of disease germs: THEOBALD SMITH.—In studying hog cholera lately a form was discovered in addition to the one known since 1885, which produces the same disease in a milder fashion. This led the author to consider the variability of disease germs.

Trimorphism in Uromyces Trifolii: MISS J. K. HOWELL.—The paper is a record of cultures made to determine the connection of the three forms of spores which are associated with the rust on clover. It was found that the æcidiospores germinated at all times during the winter and as the result of their growth produced on the host abundant uredosori, thus proving beyond doubt that the assumed relationship between the æcidium and the other forms actually exists.

Observations on the life-history of Uncinula spiralis: B. T. GALLOWAY.—An account of the life-history of the fungus, giving the methods by which the author established the relationship between the various forms.

On the seed coats of the genus Euphorbia: L. H. PAMMEL.—This was a series of observations to ascertain diagnostic characters from the seed coats of closely related species. There was considerable variability in structure, but not of a kind to be used in the discrimination of species.

Observations on the method of growth of the prothallia of the Filicineæ, with reference to their relationships: DOUGLAS H. CAMPBELL.—The object of this paper is to defend the theory of the origin of the ferns from forms resembling liverworts and the results presented are derived from a comparison of the early stages of ferns with those of liverworts. Such a comparison presents such remarkable resemblances, especially in the method of growth, that no satisfactory explanation seems possible to the author, except that of a common origin of the two forms.

Development of the sporocarp of Griffithsia Bornetiana: V. M. SPALDING.—The author showed the great variability

in number and position of peripheral cells, including the one from which the trichophore is produced; also, the early formation of spore-producing cells, rendering it doubtful how far the production of spores is the result of fertilization. He also pointed out the differences between this and the closely related species G. corallina in the development of the sporocarp.

Contributions to the life-history of Isoetes: DOUGLAS H. CAMPBELL.—An account was given of the nuclear division, preliminary to the formation of the prothallium, and the development of the sexual organs traced, so far as the author's investigations had extended.

Geographical distribution of N. Am. plants: (1) The relation of the Mexican flora to that of the U. S., SERENO WATSON; (2) The distribution of N. Am. Umbelliferæ, JOHN M. COULTER; (3) The distribution of Hepaticæ of N. Am., LUCIEN M. UNDERWOOD; (4) The migration of weeds, BYRON D. HALSTED; (5) The distribution of N. Am. Grasses, W. J. BEAL; (6) The distribution of N. Am. Cornaceæ, JOHN M. COULTER; (7) The general distribution of N. Am. plants, N. L. BRITTON. As these seven papers were essentially abstracts themselves and are to be printed together and in full in the volume of Proceedings, no further mention need be made of them in this report.

Work of the Botanical Division of the Dep't of Agriculture: F. V. COVILLE.—The author gave an account of the work of the division in the way of exploration, publication of "Bulletins" and "Contributions," amount of money appropriated, etc., all of which was of great interest to botanists, who are all desirous of encouraging a thorough exploration of the country and the competent and speedy publication of results. A resolution was passed in the Section, adopted by the Council, and read in general session, calling the attention of the proper authorities to the fact that the valuable botanical collections now in the Department of Agriculture are not properly protected against fire, and urging the necessity of erecting a fire-proof building as soon as possible.

The continuity of protoplasm through the cell-walls of plants: W. J. BEAL and T. W. TUOMEY.—The authors had examined the cortex of 75 woody or shrubby plants, with the view of discovering the most favorable for the demonstration of protoplasmic continuity. While it was thought that in some rare cases the connecting protoplasmic strands were

large enough to be readily visible, in the vast majority of cases the exceedingly delicate fibrillæ penetrating the middle lamellæ required for demonstration the highest powers of the microscope, and the most delicate manipulation.

Potato-scab, a bacterial disease: H. L. Bolley.—By special arrangement, this paper, which belonged to the Section and will so appear in the volume of Proceedings, was read before the Botanical Club, and appears in that connection in our report.

The development and function of the so-called cypress-"knees," with a consideration of the natural habitat of the tree: W. P. Wilson.—Dr. Wilson has for several years been investigating this subject, both by means of numerous cultures and by the examination of great cypress tracts in Florida. He described four methods by which the "knees" are formed, and demonstrated that their formation always had to do with the presence of water, so that they could be produced at will in cultures. The cypress was originally a dry ground tree and this structure was an adaptation to a watery habitat. The "knees" are rapidly formed in the presence of water, and gradually rot away and disappear when water is withdrawn. A large and recently drained cypress region in Florida gave the author many proofs of this relation between the presence of water and the formation of "knees." It seems clear enough, therefore, that the function of the "knees" is the aeration of the root-structures. The paper was illustrated by a series of photographic lantern slides. The presence or absence of water not only affected the development of "knees," but the whole habit of the tree as well; as dry ground trees are tall and sparsely branched, while in water they are compact and flat-topped. The paper was exceedingly interesting, and bearing as it does upon a somewhat disputed subject, it is a gratification to know that it will soon be published and amply illustrated, the author's remarks before the Section being but a brief summary of some of the results obtained.

Preliminary note on the genus Rhynchospora in N. Am.: N. L. Britton.—The author outlined the grouping of species, of which he has made a most thorough study, and illustrated his remarks by an exhibit of specimens.

On Rusbya, a new genus of Vacciniaceæ from Bolivia: N. L. Britton.—The new genus belongs to the remarkable group of epiphytic forms, and in its narrow leaves differs from them all in general appearance.

Notes on a monograph of the genus Lechea: N. L. BRITTON.—The study of this perplexing genus is in the nature of a heritage to Dr. Britton from Mr. Wm. H. Leggett, who did much toward its elucidation. It is especially confused by the numerous species of Rafinesque, most of which seem almost impossible of identification.

The specific germ of the carnation disease: J. C. ARTHUR and H. L. BOLLEY.—In the absence of the authors this paper was read by title, but the abstract indicated the demonstration of a bacterial disease.

Notes upon plants collected by Dr. Ed. Palmer at La Paz, Lower California, in 1890: J. N. ROSE.—This paper represented part of the work being done by the Botanical Division of the Department of Agriculture. Dr. Palmer's collections from Lower California have brought to light many new and interesting plants, and Mr. Rose has long been engaged in their study. The present paper will appear in one of the forthcoming "Contributions from the National Harbarium."

Notes upon crystals in certain species of the Arum family: W. R. LAZENBY.—The relation of these crystals to acridity was discussed, the author having investigated a large number of cases, and inclining to the belief that the rhaphides are to be looked to as the explanation of acridity.

Notes on Isopyrum biternatum: C. W. HARGITT.—Professor Hargitt has been making a study of the tuberous root-swellings of this species, both as to their structure and contents. A preliminary notice of his results appears in this number of the GAZETTE.

Meeting of the Botanical Club at Indianapolis.

The Botanical Club had a very large and enthusiastic attendance, with no lack of papers or interest. The minutes of the meeting, as being of interest to all botanists, are published as follows:

The eighth annual meeting of the Botanical Club of the A. A. A. S. was called to order at 9 A. M. by the President, Dr. N. L. Britton, of Columbia College, New York, Professor C. R. Barnes being secretary. In accordance with the request of the Toronto meeting the President opened the proceedings with a brief résumé of the present state of systematic botany in North America. He gave a synopsis of

the work which is now being prosecuted in the various centers, together with mention of a number of the specialists and their investigations.

Mr. B. E. Fernow, chief of the Forestry Division of the Department of Agriculture, called attention to the subject of nomenclature, speaking of the movement for the registration of names of varieties of cultivated plants and the necessity of its direction by botanists; of the present condition of the nomenclature of trees, and of his intention to prepare a check-list of arboreous plants, embodying common as well as scientific names, in which he asks the assistance of botanists. He closed with an enumeration of the changes in the nomenclature of the common trees.

Dr. C. M. Weed, of the Agricultural Experiment Station of Ohio, spoke of a new eastern station for Actinella acaulis (a distinctively western composite) at Lakeside, O. Dr. Bessey mentioned the occurrence of this plant on the buttes of Nebraska and its entire absence on the plains.

Dr. Weed also called attention to the protection against borers afforded by the milky juice of certain plants. Dr. Burrill had received from a Grecian botanist an account of similar protection to the fig tree against its insect enemies.

Dr. W. J. Beal, of the Agricultural College of Michigan, spoke of the tubercles occurring on the larger roots of Ceanothus Americanus. Dr. Britton mentioned a similar observation by Dr. Thurber on Rhexia Virginica.

Dr. T. J. Burrill, of Illinois University, objected to the discarding of the genus Bacterium, as has been done by some bacteriologists. He pointed out the characteristics of the genus.

After announcements by the secretary, the club adjourned to 9 A. M. Friday.

FRIDAY, AUGUST 22.—A new hollyhock disease was described by Miss Effie A. Southworth. It is due to a fungus of the genus Colletotrichium, a new species which the author designates as C. Althææ. It attacks the stalk, petiole and leaves of greenhouse grown plants chiefly and causes a loss of 25 to 100 %. One experiment seems to indicate that the Bordeaux mixture may prove effective in combatting it.

Prof. F. Lamson-Scribner, Director of the Agricultural Experiment Station of Tennessee, spoke of the nature of the palea and lodicules in grasses. The conclusions drawn were: 1. That the palea are true prophylla, homologous with those which begin the culm branches, their structure

is similar and their position is the same, as they begin the branch which bears the flower and stand with their backs towards the main axis or rhachilla of the spikelet. 2. The lodicules are true scales, whose function is to expand or separate the glumes in anthesis, as the similar special epidermal development in the axils of the panicle branches serves to diverge these during the same period by pressing against the axis from which they spring.

Prof. W. R. Lazenby, of the Agricultural Experiment Station of Ohio, gave additional notes on the two forms of Ampelopsis quinquefolia, characterized by the differences in the power of clinging to walls. Peculiarities other than those of the tendrils were pointed out by other speakers. Dr. Bastin said that A. Veitchii showed similar forms.

Prof. L. H. Pammel, of the Agricultural College of Iowa, discussed the pollination of the genus Æsculus.

Dr. D. H. Campbell, of Indiana University, called attention to the occurrence of adventitious buds on Lycopodium lucidulum. The buds are at first green and later lose their chlorophyll and become yellowish. He also gave miscellaneous notes upon the germination of the spores and development of the prothallia and archegonia of various ferns.

MONDAY, AUGUST 25.—Notice of a descriptive list of the Junci of Texas was given by F. V. Coville, of the Department of Agriculture. One species is confined to Texas, 14 are of wider range and 2 are from the Rocky Mountains. No new species have been found.

Dr. J. C. Arthur, of the Indiana Agricultural Experiment Station, exhibited drawings of physiological apparatus as used in his laboratory. Additional suggestions were made by Messrs. Seaman, Bessey and Spalding. Dr. Bessey suggested that members bring drawings next year of their most successful apparatus.

Mr. F. V. Coville reported that the Botanical Exchange Club was in possession of about 5,000 specimens and would be able to enter upon extensive exchanges during the coming year. Mr. Seaman spoke of the necessity of preparing perfect specimens.

Prof. E. W. Claypole presented notes on various colonists at Akron, O., such as Conium maculatum, Tragopogon porrifolius, Artemisia vulgaris, Cnicus arvensis, and Lactuca Scariola. Dr. Burrill confirmed the occurrence of the two forms of Canada thistle and the variety of the seed-producing plants. The introduction of various weeds was noted by Prof. Arthur, Mr. Blatchley and others.

F. V. Coville exhibited a new form of collecting knife, the cotton knife of the inspectors of baled cotton.

TUESDAY, AUGUST 26.—In three short notes by Dr. B. D. Halsted, attention was called to the occurrence of double flowers in wild Convolvulus sepium; to peculiarities of the pollen of Epilobium palustre var. oliganthum; and to a supposed hybrid between Tragopogon porrifolius and T. pratensis.

Miss E. Porter, of Cornell University, described a mode of spore discharge in a species of Pleospora in which the spores are expelled simultaneously after the elongation of the inner coat of the ascus and its circumscissile dehiscence.

H. L. Bolley, of Purdue University, explained the results of a large series of experiments on potato scab which he is confident is a bacterial disease. The author also discussed the histology and biology of the disease fully and gave an outline of infection and culture experiments. The work was very highly commended by Dr. Burrill who had given attention to the disease himself. Dr. Arthur pointed out the curious fact that in order to succeed with infection experiments the tubers must not only be attached to the plant but must be in a healthy growing condition.

The officers elected for next year are: President, Wm. M. Canby, of Wilmington, Del.; Vice-President, L. M. Underwood, of Syracuse, N. Y.; Secretary, B. T. Galloway, Washington, D. C.

BRIEFER ARTICLES.

Excursion of the Botanical Club.—The botanists were excused on Monday afternoon of the Association meeting, to take the promised excursion to the "Shades of Death." About seventy registered for the trip, and at 12:30 a special train, furnished with the compliments of the I. D. & W. Railway, steamed out of the Union Station for a quick run of nearly fifty miles towards the west. Upon reaching South Wavela: d carriages met the party and they were soon driving across the country a distance of seven miles to a young summer resort known to its management as "Garland Dell," but to the region thereabouts as the "Shades of Death." A deep and narrow gorge has been cut into the heavy subcarboniferous sandstones, a stream of water and abundant springs keep it moist, and the result is not only some beautiful scenery, but also a lavish display of such plants as delight in cool and damp and shady spots. The botanical crowd was soon scattered into little groups that kindred tastes brought together. There were collectors of Myxomycetes, of parasitic

fungi, of saprophytic forms, of mosses and ferns, and flowering plants. Altogether it was a company well distributed in interest as well as in locality. From Dr. Sereno Watson on the east to Mr. Fletcher of Canada on the north, and Dr. Bessey on the west, and southward to Frank Earle on the Gulf, is the range represented by that collection of botanists. Those who live at intermediate stations need not expect to have their names mentioned, but they were there, over sixty strong.

These sandstone gorges are in the midst of untouched Indiana forest, and in the evening dinner was served on tables that were placed in the open air under the trees. The meal was ample and so were the appetites, and the drive back through the moonlight to the special train brought to a close one of the most delightful botanical excursions the Club has ever enjoyed.

After dinner the Club passed the following resolutions:

Resolved, That we do hereby express our most hearty thanks to the local committee for the thoughtfulness and care with which all the details of the excursion were planned and carried out so as to give to the party a most pleasurable entertainment; to Mr. R. B. F. Pierce, of the Indianapolis, Decatur and Western Railway, to whom we are indebted for free transportation on the railroad, and to Superintendent L. A. Boyd for his courtesy in accompanying the train and giving personal attention to our comfort and safety.

Resolved, furthermore, That we tender our hearty thanks to Mr. J. W. Leech for the satisfactory repast with which we were regaled at his delightful summer resort, and for the kindly attention he gave us as his guests.

Preliminary notes on Isopyrum biternatum.—Following a suggestion made to the writer by J. M. Coulter, I began some time since a study of the little plant whose name forms the subject of this paper. It is an insignificant member, in point of size at least, of the Ranunculaceæ. In general appearance it greatly resembles its near relation, the little Anemonella, both as to size and structure. It may be most easily distinguished by an examination of the fruit or of the root. The latter presents the appearance of a chain of tuberous-like thickenings, gradually diminishing in size toward the growing ends of the roots.

The fruit is not an achene, as in Anemonella, but a pod, or rather four pods forming a spreading sort of quadrangle. The number, however, is not invariable, occasionally but two, frequently three, appearing in maturity, though the embryology shows normally four. The flower, also, is not subject to the remarkable variability exhibited by Anemonella, having as a rule five petaloid sepals.

A study of the micro-chemical character of the tuberous-like thickenings of the roots revealed the absence, much to my surprise, of any deposits of starch therein. Further reactions revealed the presence in the cells of the subepidermal tissue of small quantities of aleurone. Still further investigation showed the presence in the fundamental tissue of inulin. This appeared the chief storage product of the plant. The same

was also found to be the case with the thickened roots of Anemonella, though in greatly increased amounts.

A study of the histology of the stem and root showed the presence of the usual elements of higher plant structure. The fibro vasal bundles of the stem were some five to seven in number, of the usual form, and forming a circle about the hollow of the stem.

The root in the smaller and normal portions showed likewise no specially peculiar characters, but in the thickened portions exhibited a peculiarity quite interesting. The thickening seems due almost entirely to a special redundancy, or increase of the cells of the central cylinder, chiefly of the conjunctive parenchyma.

The histology of these thickened tuberous portions very clearly shows that they are true roots. The fibro-vasal bundles are centrally located, but very materially altered in appearance by the excessive development of conjunctive parenchyma. This thickening gradually crowds the endodermis toward the surface of the root, till in the older portions it would not be recognized except by very careful observations, but might easily be mistaken for an inner-like border of subepidermal tissue. The arrangement of the elements of the fibro vasal bundles is also somewhat peculiar. In general they present the aspect of a biradial bundle, with the phloem elements greatly compressed and extending through the redundant parenchyma toward the endodermis something after the manner of a medullary ray. In some cases the bundles assume what might be called a triradial form, there being three of the diverging phloem masses.

This preliminary report must be considered as somewhat tentative, as I have not yet finished the micro-chemical study of the elementary structure of all the parts. I hope soon to have ready a full account of studies upon its general anatomy and organogeny, with a series of figures illustrating points of special interest and importance.—C. W. HARGITT, *Miami University, Oxford, Ohio.*

EDITORIAL.

[The editors of the GAZETTE depart from their custom in presenting as an editorial the following, from a prominent botanist, as an incisive expression of their own sentiments:]

THE EDITORIAL in the last GAZETTE, on botanical instruction in the colleges and universities of the United States, is certainly a timely one. The one-sided method of teaching biology pursued in one of our great universities and emphasized in more than one text-book is distinctly deplorable. One even notes in certain circles a tendency to read botany out of the scientific party altogether. I do not know whether the workers on animals have become ashamed of the word "zoölogy" or not—surely they have no more reason to discard it than botanists have to discard the word "botany," for both are connected with some very bad and very much abandoned methods of teaching –but there are a number of

zoölogists who talk of "animal biology," and manifest at the same time a peculiar facility for dropping the modifying adjective noun. So we hear of "biology"—and that means echinoderms and whales and salpa-chains and the embryology of the guinea-pig. It occasionally means the fibro-vascular bundle of Pteris, but this poor, lonely Pteris comes in timidly and in great confusion, amid the eccentric hydroids and cetaceans. I have had students observe to me with winning confidence that they have "had" botany, but "biology,"—that is mystery still. Men are sent out from the university referred to in the GAZETTE editorial, and from other American institutions, who are totally devoid of any botanical training and totally pervaded with an uncontrollable yearning to label their zoölogical courses with the word "biology." I notice in the introduction of Dr. D. H. Campbell's very excellent little text-book on structural and systematic botany, lately from the press, the following clear definition of the term biology: 'The science that treats of living things irrespective of the distinction between plant and animal is called 'Biology.'" That is the generally accepted meaning of the word, and it is as exhilarating to observe zoölogists attempting to preëmpt the whole field with calm unphilological assumption as it would be to hear an electrician call his science "engineering" or a Greek instructor talk of "language study," meaning thereby the accentuation of Homer or Thucydides. Doubtless this uncritical use of terminology is fostered by the uncritical study of biology which obtains whenever the great coördinate branch of botany is lopped off and thrown in the fire as a preliminary. Possibly, too, it is due to diffidence and possibly to sheer ignorance. But principally, I am inclined to think, it is the child of shrinking one-sidedness, the progeny of ill-balanced courses of study and of past iniquity in methods of zoölogical instruction which makes the very word "zoölogy" distasteful to the teacher of to-day.

OPEN LETTERS.

Rattlesnake antidote.

"Important if true" is a motto often illustrated in botanical research. This very week a gentleman has died in our vicinity who was bitten by a rattlesnake—died though he had the nerve to amputate his own finger with his jack knife on the field.

A clergyman of this region, the Rev. Mr. Clark, who has been in the state since the early history of it as a territory, has for two years been calling my attention to a weed by which he claims to have saved several lives. He claims it to be a safe and sure cure for rattlesnake bite. This week I have at last succeeded in getting from him the plant in bloom, and it proves to be *Hieracium Scouleri* Hook. He is very anxious that I should publish the plant and the method of use. The plant is taken up whole and fresh, though he believes it can be made into a druggist preparation by pulverized powders, or a decoction, or an extract. The plant

in its fresh state is bruised and mashed, and then gently steeped in milk. This after straining is to be drank in large quantities until the patient has fully recovered. Mr. Clark affirms that he has successfully treated several patients by this method and has never yet lost a case. He is an intelligent minister in regular standing and active service of the Methodist Episcopal Church South, and in early days when physicians were scarce, did considerable practice of medicine. He is thoroughly positive and candid in his belief of the efficacy of this Hieracium as a cure for rattlesnake poison. Not being a botanist he did not know the name of the weed, and until to-day I have been unable to say what the weed is. But to-day he succeeded in getting the plant in bloom. Rev. Clark reports the plant very abundant, but my own botanical excursions have not taken me where it can be called abundant. In Coulter's manual it is reported "From Montana to Oregon and south to the Wahsatch."

It is a well known fact that deer and antelope and other animals when bitten by rattlesnakes seek relief in eating some weed well known by hunters in early days, and Rev. Clark believes this plant to be the one.

By turning to Gray's Flora of North America (Gamopetalæ) one will see *Hieracium venosum* L. called "Rattlesnake weed." This popular name must have a history behind it, and being of the same genus of our Rocky Mountain rattlesnake weed it seems to point to the same use among the early comers to the Atlantic coast. On telling this account of Rev. Clark to a prominent physician to my surprise he did not scout and ridicule the tale, but expressed himself as interested in it and deemed the remedy as possible and probable.

Helena, Montana. F. D. KELSEY.

CURRENT LITERATURE.

Australian Algæ.[1]

Among the various contributions to the geographical distribution of the Fresh-water Algæ, which have been given by the author, this work ranks as the most complete and comprehensive in regard to the Australian Flora. The work is based upon a collection made by Dr. Berggren during his stay in that country during the years 1874 and 1875.

After giving an account of the papers hitherto published upon this subject, the author enumerates about 300 species (with exclusion of the Diatoms), of which 26 have been described as new to the science, besides several new varieties and subspecies.

In regard to the geographical distribution of the species in other countries, the author does not think it needful to give any comparison, since the occurrence of these Algæ in the extra-European countries is almost unknown. He mentions, however, that he has not observed any new genus, or any genus not represented in Europe, except the genus Phymatodocis, which occurs in America and Australia. The collector of this highly valuable material has added the following remarks upon the general occurrence of these Algæ in New Zealand: "The Fresh-

[1] OTTO NORSTEDT.—*Fresh-water Algæ, collected by Dr. S. Berggren in New Zealand and Australia*, with seven plates. (Extract from Kongl. Svenska Vetensk. Akad. Handlgr. Vol. XXII. Stockholm, 1888.

water Algæ in New Zealand do not from several causes occur so frequently as in the regions of the corresponding latitudes of the northern hemisphere. The ground which is generally sloping, gives a rapid course to rivers and brooks, and the surface occupied by stagnant water, swamps and bogs is not very extensive. The comparative small number of water and bog plants growing sociably together (such as Potamogeton and others), which in the stagnant waters and marshy spots of Europe are favorable to the existence of the Fresh-water Algæ, is of great consequence. The usually dry summer generally causes the draining of those lowland spots which in the wet season (the winter) are swampy. Therefore, the Algæ are more frequent in the damp and moss-grown localities of the mountainous regions in the northern as well as in the southern island. In the rivulets from hot springs in the Hot Lake District in the northern island the Algæ are, especially Phycochromaceæ, but likewise Confervaceæ and Zygnemaceæ, to be found growing in great abundance."

The seven plates illustrate not only the new species and varieties, but also several others, described before by other authors.—THEO. HOLM.

NOTES AND NEWS.

DR. THOMAS MORONG is expected home from South America about the first of October.

PROFESSOR F. LAMSON-SCRIBNER has been made Director of the Agricu tural Experiment Station of Tennessee.

THE AMERICAN Forestry Association met at Quebec, September 2–5, with Hon. James A. Beaver, of Pennsylvania, as President.

DE SAUSSURE'S chemical researches on vegetation, published in 1804, has just been translated from the French into German. It seems that the English are not alone in translating old botanical works.

MR. JAMES L. BENNETT has been elected Curator of the Herbarium at Brown University. Mr. Bennett intends to take charge of ordinary herbarium specimens, but desires to get together a museum of vegetable products to illustrate economic botany. He bespeaks aid from the botanical fraternity in this regard, and would be glad to receive specimens of fruits, fibers, fabrics, etc.

MESSRS. D. C. WORCESTER and F. S. Bowmer, recently of the University of Michigan, left July 22d for the Philippine Islands, where, through the large liberality of L. F. Menage, of Minneapolis, they will spend two years in the collection of scientific material. While the principal objects they intend to secure are birds and corals, they have determined to do considerable collecting in the line of fungi, paying particular attention to the *Sphæriodiæ* and *Gasteromycetes*. Mr. Worcester was instructor in botany for some time at the University of Michigan, and while there specialized upon the *Myxomycetes*, so results may be looked for in this line. The work on the material collected will be prosecuted at Minneapolis under the auspices of the Minnesota Academy of Sciences, in the museums of which all the collections will be deposited for the use of scientific men.

THE Horticultural Department of the Cornell University Experiment Station is making a large and important collection of cultivated plants. Collectors are sent to leading nurseries and botanists are employed in many parts of the country to collect the cultivated plants from commercial establishments. Everything upon the Cornell grounds is preserved, and recently Professor L. H. Bailey has turned over to the University his whole collection of cultivated plants. Not only the species, but all cultivated varieties are preserved. This is probably the first distinct attempt of this kind in this country.

THE OUTER LAYER of the endosperm of the seeds of grasses has long been considered as a reservoir of nitrogenous substances, although several writers have suggested that it was either a conducting tissue for diastase or a ferment-producing layer. Dr. G. Haberlandt has now convinced himself by experimental researches that it can no longer be considered as belonging to the storage system, but that during the time of germination it produces and excretes diastase, belonging therefore to the glandular system. The anatomical structure of the "aleurone layer" during germination is exactly that of glandular cells. Moreover, a bit of this tissue separated from the grain and carefully washed will, if placed in contact with starch, corrode the grains and finally dissolve them, a result which was not obtained in control experiments. In order that this formation of diastase shall begin it is necessary that at least a portion of the embryo capable of growth should be present.

THE SOCIETY for the Promotion of Agricultural Science at its meeting in Indianapolis, August 18 and 19, had the largest number of papers presented before it during any time in its history. The following are a part of the botanical subjects: T. J. Burrill, "Preliminary notes upon rotting of potatoes," describing a specific Bacterium which produces soft rot; B. T. Galloway, "Some recent observations on black-rot of the grape," detailing the result of infection experiments with the spores of the fungus; B. D. Halsted, "The rots of the sweet potato," separating them under their common names and giving their comparative occurrence in New Jersey; L. H. Pammel, "Some fungus root diseases," a resumé of the present state of the subject, with personal observations; E. L. Sturtevant, "Cucurbita an American genus," bringing together a mass of facts to substantiate the claim; and C. M. Weed, "The scab of wheat heads," describing the destruction of wheat heads by a Fusisporium.

THE MOST detailed account that has yet appeared on the process of paraffin imbedding in plants is that given by Ludwig Koch in Pringsheim's Jahrbücher f. wiss. Botanik, xxi, 367–468. Exact directions are given for every step of the process, so that any one who can read them and do as he is told can not fail to secure good results. When, however, we come upon a detailed description of a microtome (5 pp.) we must own to surprise that such "padding" is permitted in this journal. Here is the way it begins: Der Körper des Mikrotoms besteht entweder aus vernickeltem Eisen oder aus Bronce. . . . An dem Körper des Instruments sind zwei Schlittenbahnen angebracht, u. s. w."! The last 60 pages contain an account of the various organs and tissues that the author has imbedded in this way, specifying the success, difficulties or failures with each. In spite of the extraordinary verbosity the paper will be extremely useful. The use of chloroform instead of turpentine in permeating the specimens with paraffin is recommended and we have found it economical of time.

Yours Truly

J. B. Ellis.